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### **EFFECTS OF UNSEASONABLE RAINS IN JANUARY 1982 ON WATERFOWL IN SOUTH-WESTERN AUSTRALIA I. RESPONSES OF SELECTED SPECIES ON COASTAL SUMMER REFUGES.**

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#### ABSTRACT

A marked decrease in overall waterfowl numbers was observed on two wetlands on the coastal plain, Herdsman and Jackadder Lakes, after exceptionally heavy rains in January 1982. However differences were observed between the responses of some species of waterfowl. While numbers of Black Swans (*Cygnus atratus*) were apparently unaffected, Pacific Black Duck (*Anas superciliosa*) showed a slight drop in numbers, Australian Shelduck (*Tadorna tadornoides*) decreased by more than fifty percent, and Gray Teal (*Anas gibberifrons*) left these lakes completely.

## INTRODUCTION

This paper examined the responses of the more common species of waterfowl after plentiful unseasonable precipitation in January 1982. The records presented here seem worthy of comment because they are derived from the Perth region and represent a further contribution to existing knowledge regarding the adaptation of waterfowl to climate.

A pioneering paper by Serventy and Marshall (1947) revealed a widespread response to precipitation (or its effects) by waterfowl in south-western Australia. While dealing with the ecology of wild ducks in inland New South Wales, Frith (1957, 1959, 1962, 1963) formulated his views on the movements of waterfowl in response to rainfall. In particular, he concluded that some species, especially the Grey Teal, are more mobile than others. Using banding and observational data, collected mostly in eastern Australia, Frith (1967) stressed the importance of nomadism among some species of waterfowl.

In the Perth region, Ford (1958) published a census of duck populations on North, Bibra and Yangebup Lakes (including several nearby swamps) during the period July 1954 to June 1957. Following unusually heavy precipitation in mid-February 1955 (discussed by Serventy and Marshall, 1957) numbers of birds, especially Grey Teal, declined rapidly.

It appears clear that the triggering factor for at least some bird movements is rainfall. By means of statistical modelling Gentilli and Bekle (1983) demonstrate the existence of a seasonally swinging (pendular) migratory system of Grey Teal between inland breeding areas and the Perth wetlands, but this movement follows the pattern of seasonal rains more closely. In pendular migration between breeding areas and "over-summering" refuges it is the surface hydrology of the breeding areas, primarily determined by rainfall, that starts and closes the migratory swing.

### THE UNSEASONABLE RAINS OF JANUARY 1982

Perth, which has a January average rainfall of 8mm, in 1982 had its highest January rainfall on record (115mm), as the result of tropical cyclone Errol. The cyclone which formed off the Kimberley coast, travelled south very slowly and took a week before it began to affect the south-west region. By 20 January, the cyclone was crossing the Tropic of Capricorn, and rainfall was still light further south; the wind had abated and the cyclone was now reduced to a rain-bearing depression, although the high temperature and near-saturation of its air column left it with an immense rain-bearing potential. On 21 January, as the depression crossed the coast in the vicinity of Geraldton, its southern stream was lifted by the denser air of a small anticyclone situated south of Esperance releasing a rainfall of extraordinary intensity and persistence. This continued during part of the following day. The table shows the daily total received at some localities, and the map (by courtesy of the *West Australian* Newspaper) the overall amount fallen over the region between Perth and Albany. Many stations in the South Central District received half their annual rainfall in less than two days, and extensive flooding was inevitable.

Rainfall in 24 hours ending at 09.00 (January, 1982).

| Station    | 20.1 | 21.1 | 22.1 | Total (mm) |
|------------|------|------|------|------------|
| Perth      | 2.6  | 54.6 | 45   | 102.2      |
| Beverley   | 2    | 42   | 15   | 59         |
| Katanning  | 4    | 116  | 95   | 215        |
| Lake Grace | 2    | 70   | 6    | 78         |
| Narrogin   | 13   | 91   | 46   | 150        |
| Wagin      | 5    | 96   | 64   | 165        |

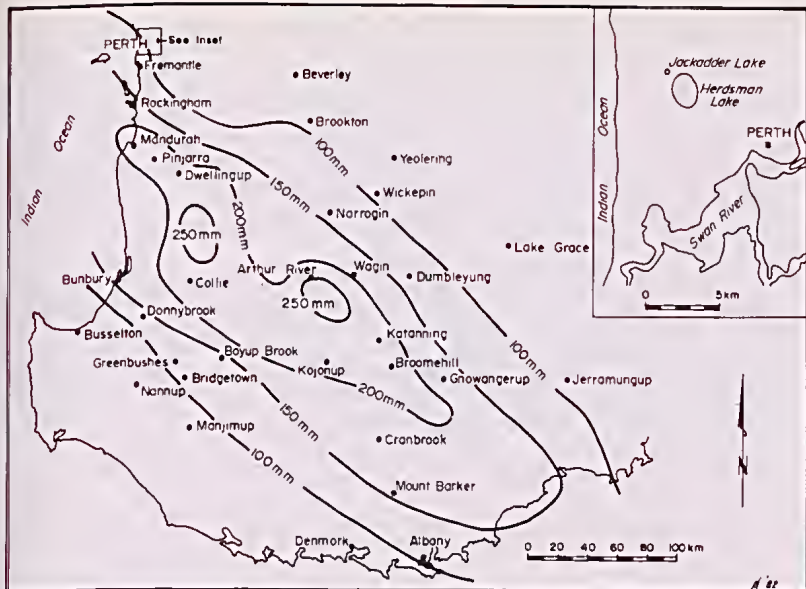


Figure 1. The map shows the rainfall of 100 mm or more in the south-west corner of the State from 20 to 22 January 1982. Locations of the two Perth lakes surveyed, Herdsman and Jackadder Lakes, are indicated in the inset.

## OBSERVATIONS IN THE PERTH REGION

### Study Sites

The two lakes surveyed in detail were Herdsman Lake (some 400 hectares) and the much smaller Jackadder Lake (13 hectares); their locations are shown in Figure 1. Herdsman Lake is a shallow wetland about 7 kilometres north-west of the centre of Perth. Most of the surface area of the basin is covered in bulrushes (*Typha orientalis*) — similar to the cumbungi of eastern Australia — and is seasonally flooded. Part of the south-western portion has been dredged in order to "landscape" for a housing development, and an area of free water created. The birdlife and ecology of Herdsman Lake are described in greater detail by Serventy (1948), Bekle (1981) and Curry (1981). Jackadder Lake, situated a short distance away, is an ornamental lake that is artificially maintained by a bore in summer. Only a few remnant flooded gums (*Eucalyptus rudis*) remain, and the lake's surrounds are grassed with couch. The Herdsman Lake basin offers a greater diversity of habitats than the open water and parklands of nearby Jackadder Lake. Despite some modification of drainage and the urban development which has encroached on Herdsman Lake, the area still remains one of the most important wetlands close to the city of Perth.

### Methods

Four surveys were made of Herdman and Jackadder Lakes: one visit on 15 January 1982, five days prior to the rains, and three more visits at weekly intervals after the event. Numbers of waterfowl were determined by counts obtained while walking around the water's edge of both lakes, between 1700 and 1900 hours. Observations at Herdsman lake were confined to the free water area, where the majority of the lake's waterfowl population are found. Isolated birds in the extensive beds of bulrushes could not be easily detected, and therefore, were excluded from the survey.

Only four species of waterfowl were common enough for a valid comparison to be made. Listed in order of abundance before the rains, these were: Australian Shelduck, Pacific Black Duck, Black Swan and Grey Teal. The results of counts for the two lakes were combined because the bird numbers were relatively low, and the two lakes constitute one functionally related system, with waterfowl regularity commuting between them (Bekle, 1982).

## Results

Figure 2 shows the variation in numbers of the more common species of waterfowl using Herdsman and Jackadder Lakes. The number of Black Swans remained virtually unchanged after the rains, but increased slightly in the next few weeks. However, the unseasonable rains appeared to considerably affect the use of these lakes by the other three species surveyed (i.e. Australian Shelduck, Pacific Black Duck and Grey Teal). During the week following the heavy January rains, overall numbers of waterfowl in both areas dropped by about 40 percent. Mr. O. Mueller, a regular bird-watcher at Herdsman Lake, confirmed observations of a substantial and sudden decrease in numbers of waterfowl using the area. The amount and duration of the decrease in bird numbers varied between species.

While a gradual build-up in numbers is typical of many wetlands along the coastal plain, which serve as summer refuges for waterfowl during this period, Black Swans remain fairly constant in their maximum numbers from one summer to the next. These birds appear to be quite "conservative" in their movements. Although Herdsman Lake is well known as a breeding area for Black Swans (Curry, 1981 and Bekle, 1982), no early signs of courtship behaviour were observed after the January rains.

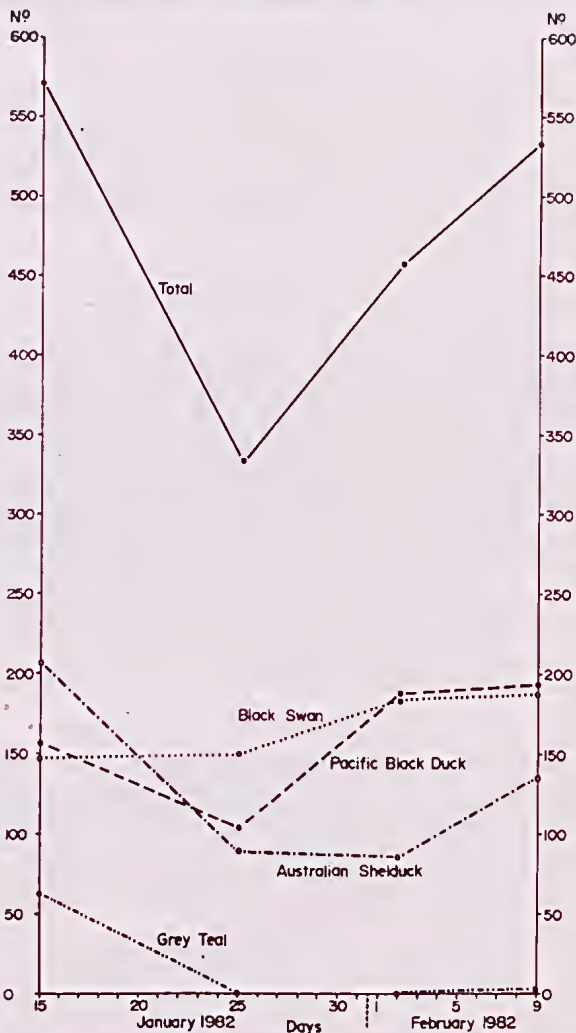


Figure 2. Numbers of four common species of waterfowl at Herdsman and Jackadder Lakes, before and after unseasonable precipitation in January 1982.

A third of the Pacific Black Duck population (52 birds) disappeared immediately after the rains, however the original number of birds was restored within two weeks. At Herdsman Lake, approximately 100 Pacific Black Duck were recorded on 22 January (O. Mueller pers. comm.), but the number dropped suddenly to 33 on 25 January 1982. During the January 1982 open season duck shooters confirmed that Pacific Black Duck were still located mainly along the coastal plain. A similar trend was noticed after the February 1955 rains; Pacific Black Duck left lakes in the Perth region after the rains, "instead of leaving while rain was still falling, as did the Grey Teal" (Ford 1958). Perhaps they only moved to nearby swamps.

The greater variation in numbers of Australian Shelduck and Grey Teal after the 1982 rainfall (compared with that of Black Swans and Pacific Black Duck) suggests that the former two species may be more mobile than the latter. Normally before this time (November, December) Australian Shelduck form substantial moulting concentrations on large bodies of water along the coast, such as Lake Preston or Peel Inlet (Jenkins, 1976). Australian Shelduck showed a greater and more prolonged decline in numbers than the Pacific Black Duck, losing 120 birds, or 57 percent of the total population counted. After three weeks the number of Australian Shelduck counted was 146, still well below the original figure of 206. Duck shooters reported seeing only low numbers of Australian Shelduck on inland wetlands. Possibly these birds rejoined their usual breeding sites, the many, thinly scattered farm dams, from which, unfortunately, no observations were at hand (Ford (1958) had recorded peak level of 441 birds on 5 February 1955, which was reduced to only a few individuals after that unseasonable rainfall).

The entire population of Grey Teal (comprising 62 birds), left the two lakes and it was three weeks before the species returned, and then only three birds were recorded at Herdsman Lake. The capacity of Grey Teal for rapid and extensive movements in search of recent flood waters (Frith, 1962, 1963), suggests that birds which disappeared from the Perth region after the January 1982 rains moved into the South Central (Agricultural) District. This is further supported by the findings of Gentilli and Bekle (1983), and reports by shooters of large concentrations of birds at newly flooded areas (e.g. Narrogin, Wagin and Katanning).

By the third week, the combined total for the four species was only 6 percent below the figure obtained prior to the rains.

#### Other Species

A few comments may be added about the much less abundant diving ducks: Blue-billed Duck (*Oxyura australis*), Musk Duck (*Biziura lobata*) and Hardhead (*Aythya australis*). Blue-billed Duck and Musk Duck appeared to remain fairly static in number on Herdsman and Jackadder Lakes, while Hardhead showed a noticeable decline after the January rainfall.

Blue-billed Duck were more common at Herdsman Lake where their numbers varied from 18 to 25. Counts of this species are difficult because odd individuals may be easily missed among the bulrushes. Musk Duck were occasionally sighted on the open waters of both Herdsman and Jackadder Lakes. Blue-billed Duck and Musk Duck, both diving species requiring fairly deep water, may remain resident at suitable habitat (Frith, 1967), which accounts for their regular presence at permanent summer refuges, including Herdsman and Jackadder Lakes. In contrast, numbers of Hardhead appear to have decreased significantly, from quite a large flock of 131 birds at Herdsman Lake on 24 December 1981 (O. Mueller pers. comm.), to 3 birds on 25 January, 11 on 2 February, and 15 on 9 February 1982. Little information was received regarding the dispersal of Hardhead after the rains. However, these birds are known to prefer both deep water lakes and swift turbulent creeks or rivers in flood (Frith, 1967). Such conditions were available for a few days after the cyclonic rains along the south coast of Western Australia.

#### GENERAL OBSERVATIONS FROM SITES ALONG THE COASTAL PLAIN

At the Bayswater Wildlife Sanctuary, a small area of swampland (4 ha.) near the Swan River, all species of waterfowl (including Pacific Black Duck, Grey Teal, Australian Shelduck) left after the rains, the only exception being Blue-billed Duck, which were recorded in larger numbers than normal (E. Singleton, pers. comm.).

Personal observations at various other lakes throughout the Perth region (e.g. at Wanneroo and Cockburn), confirm that a general decline in overall

waterfowl populations resulted after the January rains. Similar reports were received from different observers. At Loch McNess, situated about 50 kilometres north of Perth, Mr K. Shaw noted a considerable reduction in the number of ducks after the heavy rainfall.

A report from outside the Perth region but still on the coastal plain, indicates that this trend was widespread. On the Vasse and Wonnerup estuaries (Busselton), situated approximately 210 kilometres from Perth, the numbers of waterfowl showed a decrease of at least 50 percent in the week following the rains (B. Kneebone, pers. comm.).

#### CONCLUSION

It was pointed out above that important differences were observed in the level of the responses of these various species of waterfowl. Some clarification of terms is needed: "responsive" implies the bird's readiness to move to suitable breeding grounds after stimulation by heavy rains or in response to flooding, while "no response" is taken to mean that the species does not respond readily to the stimuli mentioned above (e.g. because its breeding cycle is primarily controlled by other factors such as daylength). Grey Teal responded immediately to the unseasonable rains, while other species, like Pacific Black Duck, appeared to be influenced to a much lesser extent.

The response to unseasonable rains is a result of physiological adaptation to drought. Some species, such as the Grey Teal, have adapted to a greater extent than others, such as the Pacific Black Duck. The variation in movement patterns and the relative mobility of different species has been well documented by Frith (1967). In this paper only differences in the immediate responses of various species in the Perth region to these rains have been discussed; later observations from inland locations detailing unseasonable breeding by pairs of Grey Teal, and some other species, will be the subject of another paper.

#### ACKNOWLEDGEMENTS

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